Introduction and Background

This report presents results from the "1998 Architectural and Industrial Maintenance Coatings Survey" conducted by the California Air Resources Board (CARB or ARB) for coatings sold in California during 1996. This is the sixth survey of this type conducted by the ARB for the purpose of estimating emissions from "Architectural and Industrial Maintenance Coatings" or "Architectural Coatings." Architectural coatings do not include aerosol coating products. For purposes of this survey, architectural coatings were defined as follows:

> "Architectural Coatings are coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs. Appurtenances are any accessory to a stationary structure, whether installed or detached at the proximate site of installation, including but not limited to: bathroom and kitchen fixtures; cabinets; concrete forms; doors; elevators; fences; hand railings; heating equipment, air conditioning equipment, and other fixed mechanical equipment or stationary tools; lamp posts; partitions; pipes and piping systems; rain gutters and downspouts; stairways, fixed ladders, catwalks, and fire escapes; and window screens."

The ARB's historical pattern for conducting surveys of architectural coatings is every four or five years. Previous surveys were conducted in 1976, 1981, 1985, 1989, and 1993. The information collected in the surveys is used to help the ARB and local air pollution control or air quality management districts (APCDs or AQMDs) track the volatile organic compound (VOC) emissions from architectural coatings. The surveys are also used in the development of regulations or rules to reduce the VOC emissions from architectural coatings. The efforts to regulate coatings began in the 1970s with the task force known as the Organic Solvent Regulation Study Group or "ORGSOL". This group consisted of the ARB, South Coast AQMD, Bay Area AQMD, and San Diego APCD.

The local districts have the primary responsibility for control of air pollution from stationary sources, such as the application of coatings. The local districts develop, adopt, and enforce rules and regulations under their jurisdiction to achieve and maintain the state and federal ambient air quality standards. The local districts have regulated architectural coatings in California since the 1970s.

The ARB's role over the years has been to provide technical assistance to the districts in the form of industry surveys and research. To track the emission contributions of architectural coatings, an inventory was created, which is based on the surveys. Regulatory and policy guidance has been provided by the development of a suggested control measure (SCM), which was first developed in 1977, and which has been amended in 1985 and 1989. Efforts are currently underway to again amend the ARB's architectural coatings SCM.

The 1998 Architectural Coatings Survey

In February 1998, the ARB mailed survey questionnaires to over 700 companies that potentially sold architectural coating products in California in 1996. The ARB received 340 responses, 152 of which submitted California sales data. This compares favorably to the previous three ARB surveys (conducted in 1993, 1989, and 1985), which had an average of 149 companies responding with data. Information about the companies reporting is presented in Chapter 1.

The 1998 Architectural Coatings survey requested 1996 California sales information for 58 coating categories. The rationale for collecting 1996 sales information was tied to the time when the survey was released. During the survey development in late 1997, some coating manufacturers expressed reservations in their ability to report 1997 California sales data if the survey was to be released in early 1998. In response, the ARB requested 1996 California sales data. For each of the coating categories, the survey collected sales in gallons (broken down by sales in container sizes of 1 quart and larger than 1 quart), type of application (interior/exterior/dual), and coating composition (carrier technology, percent by volume solids, density, VOC content, recommended thinning, diluent, and ingredients). A copy of the survey questionnaire is available in Appendix A.

Some manufacturers considered the data provided in the 1998 Architectural Coatings Survey to be trade secret and confidential. To address this concern, but still allow the publishing of survey results, the ARB implemented the historical practice of concealing all data values that did not represent at least three companies, otherwise known as the "Three Company Rule." Every effort was made to reveal as much of the survey data as possible without compromising the "Three Company Rule." Unfortunately instances did arise which required certain portions of the survey results to be concealed. Throughout this report the term "Protected Data" is encountered. The purpose of this term is to reflect that compliance with the "Three Company Rule" could not be satisfied and the data was concealed from view.

The 1998 survey responses represent about 87.5 million gallons of the architectural coatings sold in California in 1996, with emissions of approximately 36,300 tons of VOC per year or about 100 tons per day. The contribution that the largest coating categories made to total sales volume and emissions are represented in the table below. The top ten coating categories account for 88 percent of the total coating sales in California, or 77 million gallons. The top ten emission categories account for 76 percent of the total emissions, or 27,600 tons per year. More detailed information on sales and emissions data are presented in Chapters 2 and 3, respectively.

Top 10 Coating Categories
Sales Volume & Emissions

	Category	Sales[1]	Category	Emissions[2]
1	Flat	36%	Flat	15%
2	Nonflat – medium gloss	18%	Industrial Maintenance	14%
3	Primer, Sealer, Undercoater	7%	Nonflat – medium gloss	12%
4	Bituminous	6%	Primer, Sealer, Undercoater	8%
5	Nonflat – low gloss	5%	Quick Dry – Primer, Sealer, Undercoater	6%
6	Industrial Maintenance	5%	Stain – semitransparent	5%
7	Roof	3%	Quick Dry – enamel	4%
8	Traffic	3%	Nonflat – high gloss	4%
9	Nonflat – high gloss	2%	Traffic	4%
10	Quick Dry – Primer, Sealer, Undercoater	2%	Lacquer – clear	3%
	Total	88%	Total	76%

1 Total Sales Volume = 87.5 million gallons
2 Total Emissions = 36,300 tons per year

VOC content information was also collected for all 58 coating categories. Values for VOC content summarized in this report were determined by calculating the sales weighted average and are available in Chapter 4. VOC content values appear as VOC_{Actual} and $VOC_{Regulatory.}$ VOC_{Actual}, also know as VOC of Material, is a ratio of the weight of VOCs (minus the weight of water and exempt VOCs) per a given volume of paint. VOC_{Actual} is the value used to determine emissions. The VOC content limit or standard codified in architectural coating regulations is commonly known as $VOC_{Regulatory}$. $VOC_{Regulatory}$ is a ratio of the weight of VOCs per a given volume of paint with water and exempt VOCs subtracted from both the numerator (weight) and denominator (volume). The original rationale behind the $VOC_{Regulatory}$ value was to reflect the relationship of coverage to total solids content and to provide an equivalent basis for comparing the polluting portion of solvent-borne and water-borne coatings. Also, based on industry comments, it was believed that the $VOC_{Regulatory}$ approach would prohibit coating manufacturers from simply diluting a coating with water in order to meet standards specified in coating regulations.

Organizing the large amount of sales volume and VOC content ($VOC_{Regulatory}$) data for 58 categories and depicting the information in a meaningful way was a challenge. To address this challenge, two approaches were taken and are presented in Chapters 5 and 6. Chapter 5 uses two types of graphs (Histograms and Cumulative Percent Graphs) to present sales volume and $VOC_{Regulatory}$ data by category. The histrogram graphs are merely distributions of $VOC_{Regulatory}$ in increments of 50 grams per liter with accompanying sales volume. In addition, the histograms provide general category information such as total sales, emissions, and overall sales weighted average for $VOC_{Regulatory}$. The cumulative percent graphs provide a descriptive view of each category by displaying 100 gram per liter increments of $VOC_{Regulatory}$ and the percent of

market volume complying. An added benefit of the cumulative percent graphs is that they display data that would otherwise be considered "Protected Data." Chapter 6 includes Table 6-1 which represents a comprehensive summary of the product data collected from the 1998 Architectural Coatings Survey (see Form II, Appendix A). Table 6-1 allows one to view coating category information on a side by side basis.

A new element to ARB's 1998 Architectural Coatings Survey was the collection of ingredient data in the survey questionnaire. The survey data compiled represents over 3000 distinct ingredients. Given the magnitude of displaying the ingredient data in a meaningful way, like compounds were aggregated under common names and divided into three main ingredient or speciation profiles (Overall, Solvent-borne, Water-borne). Chapter 7 contains more information regarding the ingredient data.

This report concludes with Chapter 8, which compares, where possible, the results from the ARB's 1993 Architectural Coatings Survey (1990 sales data) with the results of this survey. The table below presents a comparison of some overall data collected in the 1993 and 1998 architectural coating surveys.

Comparison of ARB's 1998 and 1993
Overall Architectural Coatings Survey Data

	1993 Survey (1990 Sales)		1998 Survey (1996 Sales)		Percent Change	
Total volume reported (gallons)	77.1 million		87.5 million[3]		+13.5%	
Water-borne/solvent-borne split by volume	76%	24%	82%	18%	+22.4	-14.9
Total estimated annual average emissions[1]	126 TPD[2]		117 TPD		-7.2%	
Water-borne/solvent-borne split by emissions[1]	28%	72%	33%	67%	+9.4	-13.6
Volume per capita (gallons per capita)	2.6		2.7		+3.9%	
Emissions per capita[1] (pounds per capita)	3.1		2.6		-16.1%	

1 These emission estimates include emissions from thinning and clean-up.
2 This is a 1990 value. For comparison purposes, ARB's emissions inventory estimates emissions of 128 TPD in 1996.
3 The top 10 survey respondents account for 75% or 65.6 million gallons. The remaining survey respondents (142) account for 25% or 21.9 million gallons.